Anaesthesia in Japan: past and present

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The author spent a year in Japan, at Kyoto University Hospital, as a research fellow, under the joint fellowship scheme organized by the Royal Society and the Japan Society for the Promotion of Science. As the first British-trained anaesthetist to work in Japan, he visited a number of institutions around the country, and recounts here his impressions of anaesthesia in particular, and medicine in general, with some historical background of the development of anaesthesia in Japan.

Historical background

From the early 1600s until 1853, Japan was effectively closed to all external influences by the establishment of the Shogunate system of government, a fiercely oppressive military dictatorship, which left the Emperor as a puppet figure isolated from his people in a form of protective custody but still revered as a direct descendant of the gods. Dealings with the outside world were conducted through a small trading station on the island of Deshima in the bay of Nagasaki, at the south-western end of Kyushu. This allowed strict control of the movements of visiting traders, and total censorship of foreign documents and texts, but a few western medical textbooks filtered through and reached the hands of the Japanese physicians over the years. It is recorded that a Dutch book on medicinal herbs, *Gruydt Boeck* by Bembertus Dodanaeus, published in 1644, was presented to the Tokugawa Shogun by the director of the Dutch trading station on Deshima in 1659, and that some 50 years later it was translated into Japanese. It is likely that others also penetrated the system, but translators were rare and were, in the main, European churchmen who viewed meddlement with the body with some suspicion at this time.

Throughout this period the mainstay of medicine in Japan was the ancient Chinese school, by which all diseases were subscribed to an imbalance of temper, blood and water, and treatments were directed at the correction of this balance by infusions, poultices and potions concocted from a wide variety of herb and animal extracts, and spiritual cleansing by meditation and penance. Western medicine was in some ways similar, but also counselled surgical interventions such as lancing, amputation and trepanation. To facilitate these procedures a number of soporifics were employed, including hemp, opium and alcohol. In some of the larger Japanese cities, schools of so-called western medicine were established, and debates were conducted on the merits of the various approaches.

In 1783, at the age of 23, Seishu Hanaoka left his home town of Hirayama, near Wakayama, some 60 kilometres south of presentday Osaka, to study the 'Ko-iho' school of Chinese medicine in Kyoto for 3 years[1,2]. He was from a family with 200 years of medical tradition, and in these 3 years he was exposed to both western and Chinese schools of thought, tempered with the moral tenets of Confucianism.

On his return to Hirayama, he embarked on a long-term project to recreate the potent oral anaesthetic which a third century Chinese physician, Houa T'o, was rumoured to have employed, and with which he hoped to expand on some of the Western surgical techniques he had studied. After some 20 years of experimentation, mainly utilizing dogs (one of the earliest recorded series of pharmacological evaluations using experimental animals), he arrived at a formulation which he named Tsusen-san and which he was prepared to try on humans (Table 1). He discussed the matter with his wife and his mother, and came to the conclusion that while he could easily obtain another wife, replacement mothers were less easy to come by, and accordingly his wife became the first human subject to receive Tsusen-san, recovering unharmed (Figure 1). She took part in a number of other experiments over the ensuing years, as a result of which she lost her sight in early middle age.

On 13 October 1805 Hanaoka performed a mastectomy on a 60-year-old woman. She recovered well and was able to return to normal life after 20 days. Following this initial success, Hanaoka went on to perform a hitherto unheard of variety of procedures with the help of Tsusen-san, including 150 mastectomies, hernia repairs, varicose vein operations, burrholes, and anal and vaginal repairs for atresias (Figure 2). He designed a number of surgical tools and described the use of 'ardent spirits' for cleansing the skin. The work on anaesthesia continued, and he wrote eloquent treatises on preoperative assessment of the patient for anaesthesia, listing conditions which might adversely affect the outcome of the operation, described intraoperative signs of depth of coma, and experimented with a number of stimulants to hasten recovery. He constructed dose-response curves of dose against duration of effect for subjects of varying age, size and sex, and noted that purgation hastened onset and decreased duration of anaesthesia, while ileus or constipation made his potion less predictable.

In recent years, other families have claimed that their ancestors used oral anaesthesia before Hanaoka, but while there may be some justification to their claims, Hanaoka was undoubtedly the first to describe his findings in a valid and scientific manner and fully deserves his position as the father of anaesthesia and modern surgery in Japan (Figure 3). His methods held sway for the next 50 years, even after his death in 1835, and a place at The Seishu Hanaoka School of Medicine in Wakayama was highly coveted. On graduation, students were sworn

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Table 1. Hanaoka's anaesthetic Tsusen-san'

Japanese name	*Common name*	*Genus*	*Part used*	*Ratio*	*Active constituents*	*Probable effects*
Mandrake	Thornapple	*Datura stramonium*	Leaves and seeds	8	Hyoscyamine Atropine Hyoscine	CNS depressive
So-uzu	Wolfsbane monkshood	*Aconitum japonicum*	Root	2	Aconitine	Vagal stimulation Depresses myocardial contractility Muscle weakness Analgesia
Byakushu	Angelica	*Angelica glabrae*	Root	2	Angelic acid	Diaphoretic Carminative Diuretic
Tohki	Bergamot (flavour in Earl Grey tea)	*Ligusticum acutilobum*	Root	2	Bergapten oil Bergamot oil	?
Senkyu		*Cuiolium officinale*	Rhizome	2	Celery oil Nepeta	?
Nanshosha		*Arisaema japonicum*	Rhizome	1	Saponin	Stimulant of digestion and absorption

The anaesthesia produced is very similar to the picture seen in atropine/hyoscine overdose. The coma produced lasted between 6 and 12 hours, and surgery was usually undertaken after 4 hours when the potion was 85–90% effective

Antidotes: Sanoh-to (containing *Rheum officinale* or rhubarb, a cathartic, *Coptis anemonifolia* or berberine, cathartic and antipyretic, also said to 'clear the brain')
Ohren-gedkuka-sekkoto (juice of the black soy bean, a mild CNS stimulant)

Figure 1. Hanaoka and his mother watching over his wife after administration of Tsusen-san. This print hangs in the Hall of Fame in the International College of Surgeons, Chicago

Figure 2. Hanaoka at work. Note the use of ligature to aid retraction

not to divulge the techniques and formulae they had learnt, thus maintaining their exclusivity and preventing competition from physicians of other schools.

The face of life in Japan was radically changed by the arrival of the American fleet off their coast in 1853 and, under pressure from Commodore Perry, the Japanese government was forced into opening their country to the outside world, culminating in the Meiji Restoration in 1867. During this period, ether was introduced by Sekei Sugata in 1855 and was followed by chloroform in 1861. The superiority of these agents to oral anaesthesia was immediately recognized, and Tsusen-san rapidly disappeared from the clinical scene.

The dominant influence in medicine in Japan was now assumed by Germany, and a number of the medical schools in Japan, including Tokyo University Medical School, were founded during this early period by German dignitaries. Teachers of medicine were recruited from Europe, and German became the standard language of medical notes; it is still

Figure 3. Hanaoka in later life. The inscription encourages the newly qualified practitioner to 'Eschew the trappings of prosperity, such as good horses and fine clothes, and seek only to cure the incurable'. (Reproduced from the original; part of the diploma awarded to successful graduates of the Sieshu Hanaoka School of Medicine, by courtesy of Professor H Ueyama, Wakayama Medical College)

used in the more reactionary specialties, particularly obstetrics. In 1873 the Japanese government representative in Leipsig, charged with recruiting 'a man of good education, correct manners, and short stature', contracted Ferdinand Edelbert Junker to be the chief of a new medical school in Kyoto (Figure 4). He taught anatomy and gave demonstrations of chloroform anaesthesia, but records are few, and it is not certain if he actually gave clinical anaesthetics. He completed his contract, but eventually left under a cloud after a dispute with the civic authorities over the garden at his residence which resulted in his destroying a beautiful stone lantern, a considerable insult to the artistic sensibilities of the Japanese[3,4].

Despite this minor contretemps, German influence held sway until the end of the Second World War, when for obvious reasons the Americans assumed the mantle. Of the 80 or so professors of anaesthesia in Japan today, two-thirds have worked or studied in the USA for a year or more. A great many American anaesthesiologists have toured and lectured in Japan, and most Japanese research is published in American journals. Appreciation of the current status of anaesthesia in Europe in general and in Britain in particular is rare, although Sir Robert McIntosh's demonstrations of the EMO inhaler in the 1960s are still vividly remembered. More recently, Dr John Nunn has toured the country and BOC have begun to break into the equipment market. British textbooks have become more readily available, and a few British papers and guest lecturers have appeared at the annual congress of the Japanese Society of Anaesthesiologists. This, together with the appearance of Japanese anaesthetists at congresses in this and other European countries, and the presence of an increasing number of Japanese workers at academic centres in Europe, will hopefully lend a more cosmopolitan air to their current practices.

Figure 4. Junker demonstrating his inhaler. Traditional Japanese artists indicated the relative importance of their subjects in scenes such as this by size. The gentleman on the far side of the bed is probably the senior surgeon, and appears to be examining the pupils, while the operator is employing a curious backhand technique with a saw for amputation, presumably for artistic purposes rather than any practical benefit. (Courtesy of Dr T Boulton)

Current practice

Most people in the West picture Japan as a modern, rapidly developing society, keeping pace with and in some respects moving ahead of the western world. While this probably holds true in commercial and industrial fields, in many aspects of everyday life, including health care, she is still very much a Third World country. The concept of central control of public health is still largely in its infancy. Only one city, Gifu, and some 30% of the population as a whole, is connected to a main sewerage system, the remainder being served by communal cesspits, the contents of which are transported away in tankers, mostly at night. General practitioners are non-existent, and patients have to take pot-luck with the large number of specialists in individual practice, beginning with a specialist in internal medicine and being referred on as necessary. The idea of terminal care facilities is slowly beginning to develop, but the main burden is currently borne by the family.

All medical care is financed through insurance schemes, mainly organized by labour unions. The union system in Japan may be classified as a vertical structure in that all the members of a company, from the directors down to the shop floor, belong to the same organization; and most big companies have their own union, as opposed to the transverse linking of workers with similar skills across different industries which exists in most western societies. This has the advantage of encouraging inter-company competition, rather than the continual confrontation between workers and employers so commonly encountered elsewhere. The government also runs insurance schemes for the self-employed, or for workers in companies not large enough to support their own union. The only route to free care is the possession of a particularly interesting condition which is of academic or teaching value to a university hospital. Within the hospitals ancillary services are rudimentary, some of the portering and general care being carried out by the family, who frequently camp in the ward next to the patient. If the insurance cover is not adequate for the treatment and hospitalization required, the family may bring in food and other chargeable necessities to help lessen the expense. Many of the routine investigations are carried out by junior doctors on the ward rather than laboratory staff. As a lot of the buildings were thrown up in the welter of activity which followed the Second World War, they are generally rather shabby, but are already being pulled down and being replaced with structures that would be the envy of most health authorities in Britain.

Medical education consists of 6 years training, the first 2 years being more general in content than is currently the case in Europe, while the 4 clinical years mainly consist of lectures and tutorials with relatively little ward or clinic work. As there is no equivalent of the preregistration year, graduates may pass straight into the specialties, including anaesthesia, with virtually no experience in general medical care. It is of interest that, while western countries are tending towards more general training prior to specialization, Japan is moving in the opposite direction, having only relatively recently abandoned the internship year.

Centralization of operating theatres is also a recent development and some specialties have refused to join this arrangement. In Kyoto University Hospital, thoracic surgery is still carried out in a separate block, without the help of the anaesthetic department, anaesthesia being managed by the surgeons themselves. Indeed, operator-anaesthetists are still very much in evidence, particularly in the smaller private hospitals and in gynaecology and orthopaedic. In one hospital visited by the author in Wakayama, 3 patients, lined up on 3 tables in the same operating room, all received spinals from a surgeon in quick succession, and 3 teams of surgeons set to simultaneously with no separating screens while nurses monitored the patients' peroperative progress (Figure 5). It is normal practice for doctors to treat their own relatives, and thus an obstetrician may anaesthetize and perform a caesarean section on his own wife, and pause to resuscitate his own child before completing the surgery, or even abort his own offspring.

Anaesthesia and other specialties which, until recently, had been relatively unpopular career choices with graduates, are now benefiting from the congestion in general medicine and surgery, and attracting a higher standard of applicant. However,

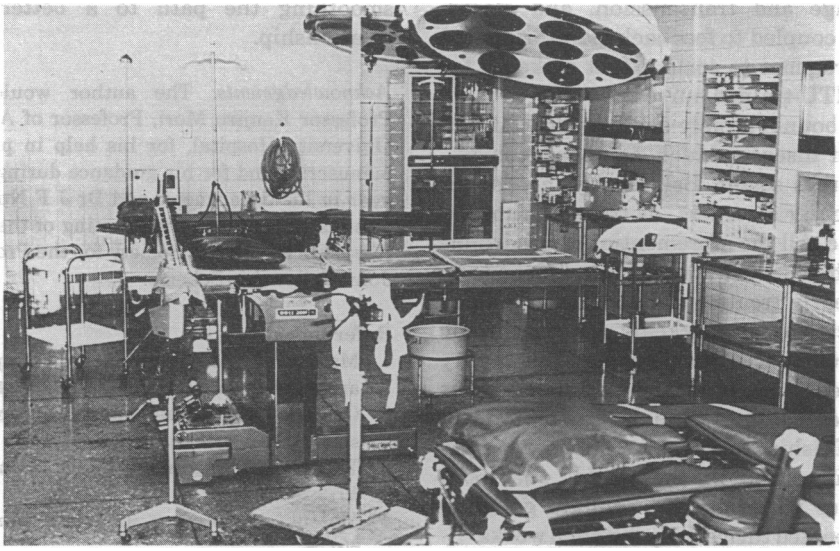

Figure 5. Operating theatre with three tables

service specialities are unable to match the very high earning potential of the primary care specialist in individual practice. Despite the increase in the number of anaesthetic juniors, many of the posts are still filled by career surgeons who leave after 6 months or a year to become operator-anaesthetists either for their colleagues or alone.

There is no equivalent of the operating department assistant or anaesthetic nurse in Japan; theatre complexes are run by a theatre manager who is responsible for equipment and stock. All the necessary equipment for anaesthesia is kept in a central store area, from which each anaesthetist must compile his trolley of drugs, tubes, etc., and then take it to the theatre in which he is working; it is here that the patient is induced, as there are no anaesthetic rooms. Until recently, all patients received atropine alone as a premedicant, but the benzodiazepines are rapidly gaining popularity. Induction and maintenance are broadly similar to current practice in Britain, but as most surgery is relatively slow, very little mask anaesthesia is seen; paralysis and intubation with manual ventilation through a circle system is the most commonly employed technique, with frequent usage of invasive monitoring. Recovery facilities are uniformly poor, there being no nurses specifically assigned or trained for this duty, so the majority of patients are recovered in the theatre and returned directly to the ward. If a prolonged stay in the theatre area is deemed necessary, the patient is cared for by the anaesthetist concerned and a nurse from the theatre in which the operation was performed. This causes considerable delays in the daily programme, so speed of recovery is one of the dominant factors in the choice of anaesthetic technique. Narcotics are used sparingly, except in cardiac surgery, and enflurane has achieved much greater popularity than is currently the case in Britain. Draconian drug clearance laws, requiring further exhaustive tests even on drugs which have been in clinical use for years in other countries, mean that many useful drugs, notably naloxone, etomidate and salbutamol, are still only available for experimental use.

Associated areas of anaesthetic practice compare more favourably, with most intensive therapy units (ITU) being sumptuously equipped. Much greater use is made of computerized systems for monitoring and data storage and transmission, and closed-circuit cameras coupled to feedback monitoring and treatment programmes to some extent make up for the shortage of ITU-trained nurses.

Pain clinics abound, largely dealing with a different spectrum of disease. Much acute neurology – particularly herpes zoster, Bell's palsy, headaches and cerebrovascular disorders – is treated primarily in the pain clinic. All the aforementioned conditions are treated with repeated sympathetic blockade in the belief that early treatment, by increasing blood flow to the affected areas, markedly reduces chronic symptoms or recurrence. Some support this theory to such an extent that if local sympathectomy is ineffective, repeated total spinals are performed. At the Kanto Teishin Hospital in Tokyo, possibly the largest pain clinic in the world, over 60% of all procedures performed are stellate ganglion blocks, often repeated thrice daily for 2 or 3 weeks.

Research facilities are generally excellent, and most junior anaesthetists will have the opportunity to join a research programme after only a year of clinical work. This is particularly important as publications are the key to career advancement. Most papers are published in American journals, and the body of work is in the area of basic science in relation to anaesthesia. Most laboratories are well equipped and finance appears to be freely available, both from government sponsorship and private sources. No licence is required for animal work.

Although the basic differences in philosophy which exist between Japan and Britain, not least the fundamental differences of Buddhism and Christianity, make comparative judgments difficult, one is still left with the impression that the needs and feelings of the patient come fairly low on the list of priorities of most Japanese physicians. Unnecessary discomfort and distress, such as repeated stabs on visits to various departments on admission for the battery of tests that are routinely required, could be avoided with a little thought. Despite this apparently uncaring approach, patients are rarely heard to complain. The 400 years of feudal rule that preceded the Meiji revolution has produced a national character which combines an unwillingness to challenge those in authority with a passive acceptance of whatever their lot may be. This is illustrated by the often-quoted adage 'Be tied up when the long rope comes'. Doctors are held in great awe by the general population and are largely immune to criticism from the media and control from central government; this exalted position in society has to some extent alienated large groups of the population, who have turned away from the impersonal, scientific and professional approach, particularly of hospital doctors, and are returning to the more traditional and friendly approach provided by herbalists and pharmacists who dispense 'old fashioned' home cures as well as more conventional medicines. Indeed, the waste bins outside some outpatient departments are filled with discarded medicines that patients have found too complicated or are frightened to consume without fuller explanation. However, many recent graduates are aware of this problem and hopefully medical attitudes will change, although preferably not as rapidly a society itself is changing, and greater communication with physicians from other philosophies can, despite the very considerable language barrier, only help in smoothing the path to a better patient–doctor relationship.

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References

1 Matsuki A. Seishu Hanaoka, a Japanese pioneer in anaesthesia. *Anesthesiology* 1970;**32**:446–50
2 Ogata T. Seishu Hanaoka and his anaesthesiology and surgery. *Anaesthesia* 1933;**28**:645–52
3 Thomas KB. Ferdinand Edelbert Junker. *Anaesthesia* 1973;**28**:531–4
4 Matsuki, A. Junker in Japan. *Anaesthesia* 1974;**29**: 607–9

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